

ACCESSION #: 9907120142

NON-PUBLIC?: N

LICENSEE EVENT REPORT (LER)

FACILITY NAME: St. Lucie Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000389

TITLE: CEA Drops Result in Manual Reactor Trip

EVENT DATE: 06/04/1999 LER #: 1999-005-00 REPORT DATE: 07/06/1999

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 049

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:

50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Kenneth W. Frehafer, TELEPHONE: (561) 467-7748

Licensing Engineer

COMPONENT FAILURE DESCRIPTION:

CAUSE: B SYSTEM: AA COMPONENT: JX MANUFACTURER: C490

D AA JX

REPORTABLE EPIX: YES

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On June 4, 1999, St. Lucie Unit 2 was in Mode 1 at approximately 49 percent reactor power. An event response team was in the process of trouble shooting recent control element assembly anomalies. Unit 2 was held in reduced power pending the event response team trouble shooting results.

At 0313 hours, four sub group 21 control element assemblies fully inserted into the core during replacement of the sub group 21 power supply. A Utility licensed operator, the nuclear plant supervisor, immediately directed a manual reactor trip. The plant was stabilized in Mode 3 for repairs. Repairs were implemented, and plant restart and power ascension commenced on June 11, 1999.

The control element assembly drop event was caused by procedural inadequacies that did not require verification of the proper seating of a power switch. This resulted in loss of power to the control element assemblies when their sub group was transferred off the hold bus.

Loss of power to the sub group 21 control element assemblies was corrected by resealing the sub group 21 power switch. Procedure changes are planned to correct the lack of procedural guidance for CEA sub group power switch replacement. The event response team conducted other corrective actions related to the original control element assembly anomalies.

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Description of the Event

On June 4, 1999, St. Lucie Unit 2 was in Mode 1 at approximately 49 percent reactor power. An event response team (ERT) was in the process of investigating recent control element assembly (CEA) [EIIIS:AA] events (a CEA drop two days earlier and CEAs spontaneously transferring to their lower grippers). Unit 2 was being held in reduced power pending the ERT trouble shooting results.

The Unit 2 control element drive mechanism control system (CEDMCS) is designed to control the movement of the 91 control rod drive mechanisms.

Each control rod mechanism has 5 coils, which engage various grippers within the CEDM motor to control CEA movement. Under normal conditions, the upper gripper maintains the CEA in its last position. Should power be removed from this gripper, and the other grippers not engage to provide

movement, the CEA will drop into the core. Power for the gripper coils is provided by motor generator (MG) sets through the reactor trip switchgear.

The CEDM power source is three phase 240V AC and is designed as a floating system to tolerate single ground conditions.

Each CEA sub group utilizes a power switch that provides three-phase power for up to four CEAs. The power switch is controlled by logic timing boards and an automatic CEA timing module (ACTM) which decides which coils to fire during movement or holding of each CEA. The ACTM receives information as to the energy provided to the coil through a Hall effect transducer around each coil power cable. Should the ACTM see the possibility of a rod drop it will automatically apply additional power or transfer the CEA to the lower gripper to prevent the rod from dropping. This action is annunciated in the control room.

During trouble shooting a decision was made to install a spare power switch [EIIS:AA:JX] in sub group 21, which required the affected CEAs to be transferred to the maintenance hold bus. After the power switch was replaced, the sub group 21 CEAs were removed from the hold bus and transferred to sub group 21 while coil traces were obtained. It was observed that with the sub group 21 CEAs on the hold bus, the visicorder traces improved and with the CEAs powered by the sub group the traces were still degraded. The CEAs were placed back on the maintenance hold bus. After further testing and replacement of a logic board, sub group.21 was removed from the hold bus and transferred to the sub group. At 0313 hours,

all four sub group 21 CEAs fully inserted into the core upon deenergization of the maintenance hold bus.

The nuclear plant supervisor (NPS) immediately directed a manual reactor trip and entry into Emergency Operating Procedure (EOP) -1, "Standard Post Trip Actions". All safety functions were verified as being maintained and EOP-2, "Reactor Trip Recovery", was entered at 0323 hours. The plant was stabilized in Mode 3. The trip was determined to be uncomplicated with the exception the following issues:

- o During the performance of EOP-1, the 2C main steam reheater (MSR) temperature control valve (TCV) block valve [EIIS:SB:V], MV-08-10, would not close. In accordance with contingency actions, the MSR TCVs were closed. MV-08-10 was subsequently de-energized and manually closed.
- o The "A" side pressurizer heaters [EIIS:AB:PZR:EHTR] were de-energized due to a lo-lo level signal from the pressurizer level "X" channel.

However, the signal was not reset when pressurizer level was raised above the setpoint. A 72-hour action

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Description of the Event (cont'd)

statement was entered in accordance with Technical Specification 3.4.3 at 0313 hours on June 4, 1999, due to having less than the required number of pressurizer heaters being capable of being powered from a Class 1E electric bus.

Cause of the Event

CEA Issues

Sub group 21 CEAs spontaneously transferring to their lower grippers was caused by noise generated by the failure of the sub group 21 power switch. Disassembly of the power switch indicated a short, which most likely developed over time between a "C" phase silicon controlled rectifier (SCR) (Q125) anode and ground. Measurements of the power switch "C" phase to ground indicate a shorted condition and detailed inspection of the SCR's mylar insulating washer show a visible breakdown of the insulation and an arc path to ground. Because this condition continued for some time, inducing high noise levels into the system, various ACTM cards interpreted this abnormal condition as unfavorable upper gripper voltage. As designed, the ACTM cards transferred the CEAs to their lower grippers to prevent rod drops. Upon replacement of the sub group 21 power switch and the failed fuse associated with phase "C" the noise was no longer seen on the sub group 21 CEAs.

The June 4, 1999 rod drop event was caused by a lack of procedural guidance that should have verified that the replacement CEA sub group 21 power switch was properly seated during trouble shooting activities. The improper seating of the power switch was not apparent because twice before the sub group 21 CEAs were successfully transferred from the hold bus to the sub group power switch and back. There were no indications that the power switch was not properly seated, and that intermittent power was being

delivered to the CEAs. Eventually, the latent intermittent electrical power led to the full insertion of the sup group 21 CEAs when the hold bus was deenergized.

Post-Trip Issues

The failure of the 2C MSR TCV block valve, MV-08-10, to close was caused by dirty auxiliary contacts in the MCC control circuit.

The failure of the "A" side pressurizer heaters to reset on rising pressurizer level was caused by a faulty crimped connection in Foxboro module LC-1110X.

Analysis of the Event

This event is reportable under 10 CFR 50.73 (a)(2)(iv) as "any event or condition that resulted in a manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS)."

Analysis of Safety Significance

The CEDM control system does not provide any safety related functions and the identified problems would not have prevented the affected rods from dropping into the core to shut down the reactor. Additionally, the drop of a CEA subgroup is an analyzed event. Therefore, the conditions described above did not present an operability concern. Additionally, during CEA trouble shooting activities, a pre-evolution tailboard was conducted with Operations to install a spare power switch in

Analysis of safety Significance (cont'd)

sub group 21. When all four sub group 21 CEAs fully inserted into the core, Operations confirmed the rod drop indication and manually tripped the reactor in accordance with the pre-evolution tailboard.

Based on the above, this event had no impact on the health and safety of the public.

Corrective Actions

1. All CEDMCS sub group power switches were verified to have proper electrical and mechanical contact under work order (WO) 99010204.
2. The system (CEA coils, CEDM power distribution and power switch components for each of the 24 sub groups) was verified to be free of grounds by a megger of 250V or greater to ground.
3. Coil traces were obtained during rod movement and verified to be of proper waveform, timing, and that all phases were operating satisfactorily.
4. The auxiliary contacts for MV-08-10 were cleaned under WO 99010433.
5. The pressurizer heater control circuitry was repaired under WO 99010873.
6. Post maintenance test requirements are being developed for CEA sub group power switches and minimum checks to be performed prior to removing a CEA subgroup from the hold bus.
7. Guidelines are being developed for the repair of CEDMCS power switch modules including proper removal and installation.

Additional Information

Failed Components Identified

Component: Power Switch Assembly

Manufacturer: Combustion Engineering

Model: Part No. 35200

Similar Events

None

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Florida Power & Light Company, 6351 S. Ocean Drive, Jensen Beach, FL 34957

FPL July 6, 1999 L-99-149

10 CFR Section 50.73

U. S. Nuclear Regulatory Commission

Attn: Document Control Desk

Washington, D. C. 20555

Re: St. Lucie Unit 2

Docket No. 50-389

Reportable Event: 1999-005-00

Date of Event: June 4, 1999

CEA Drops Result in

Manual Reactor Trip

The attached Licensee Event Report 1999-005 is being submitted pursuant to
the requirements of 10 CFR Section 50.73 to provide notification of the

subject event.

Very truly yours,

J. A. Stall

Vice President

St. Lucie Nuclear Plant

JAS/EJW/KWF

Attachment

cc: Regional Administrator, USNRC, Region II

Senior Resident Inspector, USNRC, St. Lucie Nuclear Plant

an FPL Group company

*** END OF DOCUMENT ***
